(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 714 832 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.06.1996 Bulletin 1996/23

(51) Int. Cl.[6]: **B65D 1/02**

(21) Application number: **95118777.2**

(22) Date of filing: **29.11.1995**

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB IT LI LU NL SE

(30) Priority: **29.11.1994 DE 4442699**

(71) Applicant: **Schmalbach-Lubeca AG**
D-38112 Braunschweig (DE)

(72) Inventors:
- **Tevlin, John**
F-59470 Wormhout (FR)
- **Linnenbaum, Franz J.**
D-38159 Vechelde (DE)

(74) Representative: **Leonhard, Frank Reimund, Dipl.-Ing. et al**
Leonhard - Olgemöller - Fricke
Patentanwälte
Josephspitalstrasse 7
80331 München (DE)

(54) Mineral water bottle without off-taste

(57) The present invention relates to the technical field of refillable PET bottles. It is an object of the present invention to provide a refillable bottle which can be used for mineral water and is a veritable refillable bottle, i.e. which can be filled with mineral water independent of what beverage it contained before. This is achieved by means of an additive in the container wall which binds the acetaldehyde contained in the PET and by using a bottle forming process which allows the production of containers (from a preform) which can be washed at a higher temperature without noticeably shrinking.

EP 0 714 832 A1

Printed by Rank Xerox (UK) Business Services
2.11.9/3.4

Description

The present invention relates to the technical field of refillable PET bottles. Refillable PET bottles are more and more developing into a real alternative to glass bottles; however they still have their limitations. One such limitation is the temperature at which the containers can be washed without starting to shrink. Another limitation is the so-called "flavour carry-over" which implies not to use bottles which contained a specifically flavoured beverage again for a substantially differently flavoured or non-flavoured beverage. When the empty bottles are returned it is impossible to say what they contained before. For this reason, certain beverages must always be filled in new PET bottles if the fillers do not want to use sniffers, recognizing residue beverage smells in the returned bottles, to group certain bottles used for a certain beverage to the filling station for the same beverage - as recognized by the smell detecting and grouping sniffers.

If a refillable bottle is to be filled with spring water (a mineral water of spring water quality) it must not have been used for a flavoured drink such as fruit juice. The walls of PET bottles for mineral water may also not contain noticeable quantities of (free) acetaldehyde, as (free) acetaldehyde (AA) from the wall migrates into the mineral water, thus deteriorating the taste of the mineral water. AA, however, is contained in any PET-container or bottle which claims to be hot-washable, as being standard effect of the manufacturing process.

PET bottles for mineral water therefore may not give rise to flavour carry-over, and their walls must not contain free acetaldehyde which might migrate into the spring water. It is therefore **an object of the invention** to reconcile these conflicting interests and suggest a refillable bottle which can be used for mineral water and is veritably refillable, i.e. which can be refilled irrespective of what it contained before.

The invention to this problem is outlined in claim 1.

The invention is based on the fact that a specific process has been used to manufacture the container to describe the container's physical properties. The resulting bottles are hot-washable. For physical reasons, existing processes use a PET which normally results in a (relatively) high concentration of acetaldehyde (in short terms: AA) after injection moulding and blowing of the preform. It is exactly this (relatively) high AA-content which makes it impossible to use these bottles for mineral (spring) water. However, if the PET contains an additive which binds the AA contained in the wall, migration of AA into the mineral water can be avoided, and due to the manufacturing process, the bottles are hot-washable to avert carry-over by washing the bottles without the need for costly coatings. As a result of the hot washing process - at elevated temperatures of about 75°C to 85°C (Claim 2) - any flavours clinging to the wall - in which the AA is contained in bound state - are desorbed to such an extent that mineral water which is subsequently filled into the bottle is not affected.

Surprisingly, the hot-washing process removes any flavours clinging to PET bottles with the AA remaining bound by the additive and as the AA is bound, it does not affect the mineral water either, even if the bottles are stored over extended periods of time. The limitations associated with bound acetaldehyde in manufacturing the hot-washable containers are much smaller than believed in the art. The inventive concept achieves hot-washable (refillable) bottles for spring water.

It is believed that walls containing bound AA allow flavors, clinging on their surface, to fully (or almost fully) be removed by the allowed temperature range (claim 2) for the cleaning or washing liquid. Fully or almost fully removal of residual flavours would not have been achieved by hot washing only.

A low concentration of additive, whose function is to bind the acetaldehyde contained in the wall, is sufficient (Claim 3)

Four different methods of manufacturing hot-washable bottles to define the physical structure of the different bottles are suggested (claim 4).

Claim 5 depicts preferred thermostable materials which could be used in a process according to Claim 4 alternative (d).

The AA binding substance may be or comprise a polyamide, for example a low molecular weight partially aromatic polyamide (e.g. poly(m-xylylene hexanedioic amide) or poly(hexamethylene isophthalamide)) or a low molecular weight aliphatic polyamide (e.g. poly(hexamethylene hexanedioic amide) or poly(ε-caprolactame)), or a mixture thereof.

An example of an embodiment can be given without the need for drawings:

A container is made from a preform. A preform already has a thread finish at the upper end as well as a body and a bottom area, which are turned into the body and the bottom of the bottle respectively when the preform is blown under high pressure into a mould (blow moulding).

Preforms are substantially made of PET. In multi-layer processes, specific materials are injected into a mould simultaneously or one after the other (sequentially) to get a multi-layer preform. The actual container can be made in a two-step blowing/shrinking process, which first turns the preform into an over-sized intermediate container, then shrinks said container so that it is under-sized and finally blow-moulds the shrunk intermediate product to its final size. Instead of employing the above blowing/shrinking process it is also possible to use thermostable middle layers in the preforms; a polycarbonate middle layer between outer PET layers is especially suited.

Surprisingly, the hot-washing process removes any flavours clinging to PET bottles with the acetaldehyde remaining bound by the additive. Apart from washing out any flavours, the washing also cleans the container, so that it can be used for mineral waters without the risk of flavour carry-over. As the acetaldehyde is bound, it does not affect the min ral water either, even if the bottles are stored over extended periods of time. The limitations

associated with bound acetaldehyde in the manufacture of hot-washable containers are much smaller than they were generally believed to be in the art.

It is possible to fill this bottle, which was described by way of example, with flavoured drinks and refill it with natural spring mineral water without the risk of any off-flavours or off-taste being produced in either the flavoured drink or the mineral water.

Claims

1. Container, preferably a refillable bottle, consisting substantially of PET, being hot-washable and suitable for mineral water by

   (a) comprising an additive in the wall of the container which holds back or binds the acetaldehyde (AA) contained in the PET;
   (b) being manufactured from a preform in a production process that allows the container to be washed at elevated temperatures without noticeable shrinkage.

2. Container according to claim 1, the elevated washing temperature being in the range of 75°C to 85°C.

3. Container according to claim 1 or 2, comprising the additive in a concentration of 1 to 5%, preferably ≥2%.

4. Container according to any one of the preceding claims, manufactured by

   (a) a two step blowing/shrinking process that enlarges the preform in the first step to an intermediate container being of larger size than the final container, a shrinkage based on heat influence and blow-moulding of the shrunk container to its final size; or
   (b) a method in which the wall of the container becomes heat-stable when being in a heated or hot mold under maintained pressure for an extended period of time; or
   (c) adding a small amount of PEN to said PET, making the container capable for washing at the elevated temperature without noticeably changing its size; or
   (d) a middle layer, neighbored by PET-layers, the middle layer being a heat-stable material (as a stabilizing layer).

5. Container according to claim 4, comprising polycarbonate or polyethylene naphthalate (PEN) as heat-stable material.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 8777

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	CH-A-684 537 (DANIEL GANZ) 14 October 1994 * the whole document * ---	1-3	B65D1/02
A	US-A-5 006 613 (SHEPHERD FREDDIE A ET AL) 9 April 1991 * column 1, line 9 - column 2, line 25 * ---	1,4	
A	DATABASE WPI Section Ch, Week 9313 Derwent Publications Ltd., London, GB; Class A23, AN 93-104445 & JP-A-05 043 782 (KURARAY CO LTD) , 23 February 1993 * abstract * ---	1	
A	DATABASE WPI Section Ch, Week 9036 Derwent Publications Ltd., London, GB; Class A92, AN 90-271561 & JP-A-02 191 626 (TEIJIN KK) , 27 July 1990 * abstract * ---	1	
A	DE-A-42 23 197 (ZIMMER AG) 20 January 1994 * column 1, line 19 - line 44 * * column 2, line 14 - line 26 * * column 3, line 54 - line 58 * * column 6, line 21 - line 26 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
C08G
B65D
C08L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	21 February 1996	Spettel, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)